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New Cenozoic Glycymeridid Bivalves (Mollusca) from Japan

By

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松隈明彦*・岡本和夫**: 日本産新生代タマキガイ科二枚貝の新種・新亜種

It is considered that the Glycymerididae have relatively simple evolutionary lineage(s) (NICOL, 1950; MATSUKUMA, 1986a, 1986b, in press). Living species of the Glycymerididae are geographically and bathymetrically restricted to the upper shelf to subtidal zones in the tropical to sub-boreal waters of the world (NICOL, 1956). Glycymeridids have thick and solid shells and are very common in the Cenozoic shallow water sediments. Therefore, they are one of ideal materials for studies of morphological changes of a bivalve species in each geologic age and each sedimentary basin.

In Japan there are about 40 Cenozoic and 18 living glycymeridids. The living glycymeridids consist of a sub-boreal species, i.e. *Glycymeris yessoensis* (SOWERBY), several tropical species, e.g. *Glycymeris reevei* (MAYER), *Tucetona auriflua* (REEVE) and *T. pectunculus* (L.), and a number of temperate Japanese-Korean endemic species, e.g. *Glycymeris albolineata* (LISCHKE), *G. vestita* (DUNKER) and *G. imperialis* KURODA (MATSUKUMA, 1984a, b, 1986a, b, in press).

In the course of taxonomic studies of Japanese glycymeridids, we recognized that several unnamed or dubious species should be given the names to discuss origins of Japanese species. In this paper we describe three new species of genus *Glycymeris* from the Miocene of Shimane and Saitama Prefectures, and a new subspecies of *Tucetona* from the Pliocene of Okinawa Prefecture.

Abbreviations for the depository of material. The following abbreviations mean institutions where the specimens under discussion are preserved: GK—Department of Geology, Faculty of Science, Kyushu University, Fukuoka; GSEH—Geological Laboratory, Faculty of School Education, Hiroshima University, Hiroshima; KU—Department of Geology and Mineralogy, Faculty of Science, Kyoto University, Kyoto; IGPS—Institute of Geology and Paleontology, Faculty of Science, Tohoku University, Sendai; MUE—Geological Laboratory, Miyagi University of Education, Sendai; NSMT—Department of Zoology, National Science Museum, Tokyo; SHM—Saito Ho-on Kai Museum (Natural History), Sendai; UMUT—University Museum, University of Tokyo, Tokyo.

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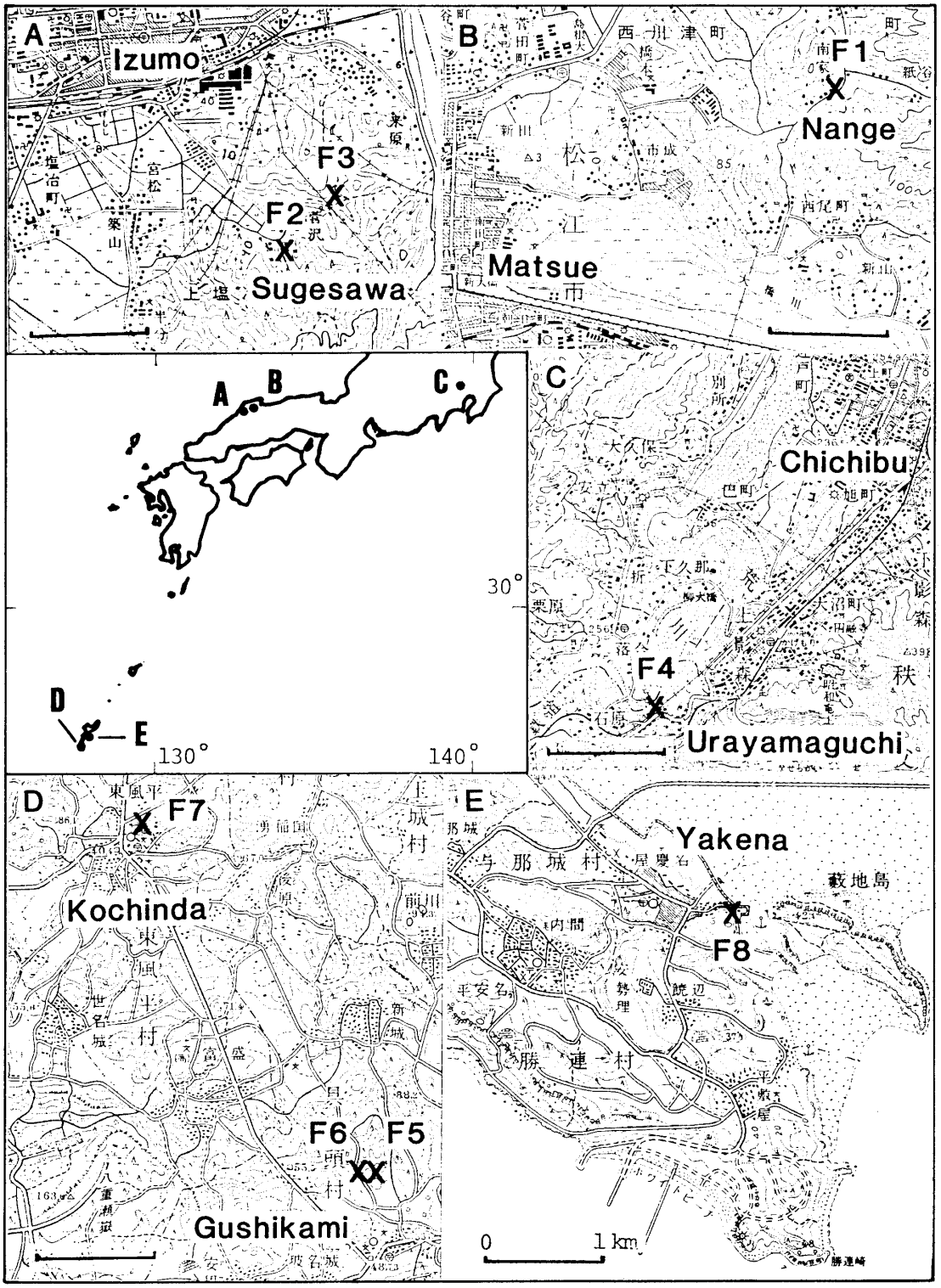

Fig. 1. Maps showing fossil localities. The following topographic maps published by the National Institute of Geography, 1:50,000 in scale, are used: A, "Matsue"; B, "Izumo"; C, "Chichibu"; D, "Itoman"; and E, "Koza-nanbu". Unit bar indicates 1 km for all maps.

Abbreviations for measurements and counts. The following abbreviations mean variables measured or counted: Cs—convexity of odd valve measured vertically to the comissure plane; H—shell height measured vertically to the hinge-axis; L—shell length measured in parallel to the hinge-axis; Nc—number of ventral crenulations counted at the inner ventral margin between the posterior border of anterior adductor scar and anterior border of the posterior scar; Nl—number of lamellar layers of the ligament, expressed by number of layers in the anterior part of the ligamental area plus that of the posterior; Nr—number of ribs on the outer surface; Nt—number of hinge-teeth, expressed by number of teeth in the anterior part of the hinge-plate plus that of the posterior.

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Description of New Species

Glycymeris subcostata MATSUKUMA and OKAMOTO, n. sp.

(Fig. 2 I)

1963 *Glycymeris* sp. n.: OKAMOTO & NAKANO, 536.
1980 *Glycymeris derelicta* (YOKOYAMA): TAKAYASU, 138–139, pl. 1, f. 15, 16.
1980 *Glycymeris* sp.: TAKAYASU, 139, pl. 1, f. 11–14.

Type. Holotype, NSMT-Mo61512, a left valve, coll. by OKAMOTO, loc. F1 [=loc. 1 of TAKAYASU, 1980], a road-side cliff, east of Nange, Kamihigashikawazu-cho, Matsue City, Shimane Prefecture, olive grey coarse tuff of the Miocene Kawazu Tuff Member, Matsue Formation. Paratypes: NSMT-Mo61513, 61514, 61516, GSEH-OKS006–019, coll. by K. OKAMOTO and K. ASANUMA from the type-locality; NSMT-Mo61515 (ex K. MASUDA, MUE, coll. by Y. TAI), Nishikawazu-cho, Matsue City, the Miocene Matsue Formation.

Diagnosis. Moderately small, subcircular to oval *Glycymeris* with rather strong, radial rib-like sculptures. Ligamental area deeply incised by many chevrons. Ventral crenulations numerous, long and narrow, pointed, aud not corresponding to irregularly spaced grooves on the outer surface.

Description. Shell moderately small in size, rather thin but solid, subcircular to dorsoventrally elongated oval, weakly compressed, subequilateral, and equivalve; juvenile shell moderately inflated, subcircular but slightly inequilateral. Beak small, low, not swollen, pointed, opisthogyrate, and placed nearly midpoint of short dorsal margin. Ligament am-

phidetic; ligamental area narrow, slightly inequilateral, anterior part longer than the posterior, incised by numerous ligamental grooves, and occasionally with 10 chevrons. Hinge-plate thick, gently rounded, and anterior part wider than the posterior; hinge-teeth strong, arranged radially, small in center, and distally inclinating. Shell surface ornamented with irregularly spaced, bi- or trifurcated rib-like ridges separated by deep grooves with rounded bottom. Grooves not correspond with the ventral crenulations; width of groove being a third or less of ridge in central part of ventral margin, and in gerontic specimen shallow and wide, nearly as broad as ridge, or occasionally defaced. Ridges rounded, cut by fine concentric growth striae, and divided by irregular secondary and tertiary grooves on ridges in the course of growth. Anterior adductor scar subtrigonal, larger than the subquadrate posterior scar; both scars not so prominent, and without buttress. Ventral margin thin, sharp, and finely crenulated; crenulations long and narrow, about 24 in number.

Measurements (mm) and counts.

	V	L	H	Cs	Nt
NSMT-Mo61512	L	30.6	26.8	(7.8)	-
NSMT-Mo61513-1	R	22.6	21.2	(5.7)	-
2	L?	23.4	21.6	(6.4)	-
3	R?	20.9	19.5	(4.8)	-
4	R	20.1	19.2	(5.0)	-
5	R+L	8.4	8.4	(2.6)	-
6	R	10.2	10.0	(3.0)	-
7	R+L	14.6	14.0	(4.5)	-
8	R+L	12.5	11.7	(4.0)	-
9	R+L	11.9	11.0	(3.1)	-
NSMT-Mo61514	R	-	36.0	9.2	7+6
NSMT-Mo61515-1	L	28.4	27.1	(7.2)	-
2	L	26.6	-	(7.0)	-
NSMT-Mo61516-1	L	37.2	35.7	(9.4)	10+8
2	R	33.8	33.7	(9.0)	-
NSMT-Mo61516-3	R	(28.2)	28.6	(7.2)	7+5
4	L	24.6	23.1	(5.5)	6+4
GSEH-OK006	L?	39.7	36.4	(9.3)	-
GSEH-OK007	R	(36.7)	36.8	(8.8)	-
GSEH-OK008	R	35.8	36.0	(10.3)	-
GSEH-OK009	L	33.7	29.7	(7.5)	-
GSEH-OK010	L	29.3	27.1	-	-
GSEH-OK011	R	25.1	22.8	(6.5)	-
GSEH-OK012	L	26.3	25.0	(7.4)	-
GSEH-OK013	L	21.4	19.8	(5.3)	-
GSEH-OK014	R	19.8	(17.8)	(5.9)	-
GSEH-OK015	L	17.6	16.6	(4.8)	-
GSEH-OK016	R	13.4	11.7	(4.3)	-
GSEH-OK017	R	9.4	8.5	(3.1)	-
GSEH-OK018	R	9.3	8.8	(2.4)	-

Associated fauna. *Glycymeris subcostata* is the most abundant species and is numbered about half of individuals in Matsue molluscan fauna at Nange, Matsue City, which is characterized by the following subtidal sandy bottom dwellers: *Anadara abdita* (MAKIYAMA), *Glycymeris cisshuensis* MAKIYAMA, *Protothaca tateiwai* MAKIYAMA, and *Phacosoma japonicum* (REEVE) (TAKAYASU, 1980; ASANUMA, 1982MS).

Distribution. Miocene: Matsue Formation, Shimane Prefecture; Ginzan Formation, Yamagata Prefecture.

Comparison. TAKAYASU (1980) refered a dorso-ventrally elongated form of *G. subcostata* from Nange to *G. derelicta* (YOKOYAMA, 1928) which had been originally described based on single left valve from the Pliocene Shiraiwa Formation at Kaigasawa, Koshi-gun, Niigata Prefecture. The holotype specimen of *G. derelicta* is a small, 28.5 mm in length, rather worn, dorso-ventrally elongated oval, thick and solid shell with numerous ligamental grooves. TAKAYASU (1980) also considered that glycymeridid species from the Miocene Yanagawa Formation (NOMURA & ZINBO, 1935) of northern extremity of Fukushima Prefecture and from the Pliocene Kubo Formation of Iwate Prefecture (CHINZEI, 1959) represent *G. derelicta* and are identical with shells from Nange. The specimens from Yanagawa (Fig. 2G) and Kubo Formations have regularly spaced, fine periostracal striae and all the material from Shiraiwa, Yanagawa and Kubo Formations have no bi- or trifurcated, distinct, rib-like sculptures.

Glycymeris izumoensis Matsukuma and Okamoto, n. sp.

(Figs. 2 A–C)

1959 *Glycymeris nipponicus* (Yokoyama): Okamoto, 8.

Type. Holotype, NSMT-Mo61507, coll. by K. Okamoto, loc. F2 [=loc. 25 of Okamoto, 1959], a small cliff at Sugesawa, Kamienya-cho, Izumo City, Shimane Prefecture, greyish coarse sandstone, the Miocene Fujina (Huzina) Formation. Paratypes: NSMT-Mo61508, 61510 & GSEH-OKS020–024, collected with the holotype; NSMT-Mo61509, coll. by K. Okamoto, S. Noguchi and C. Yuba, loc. F3, a road-side cliff about 600 m north-

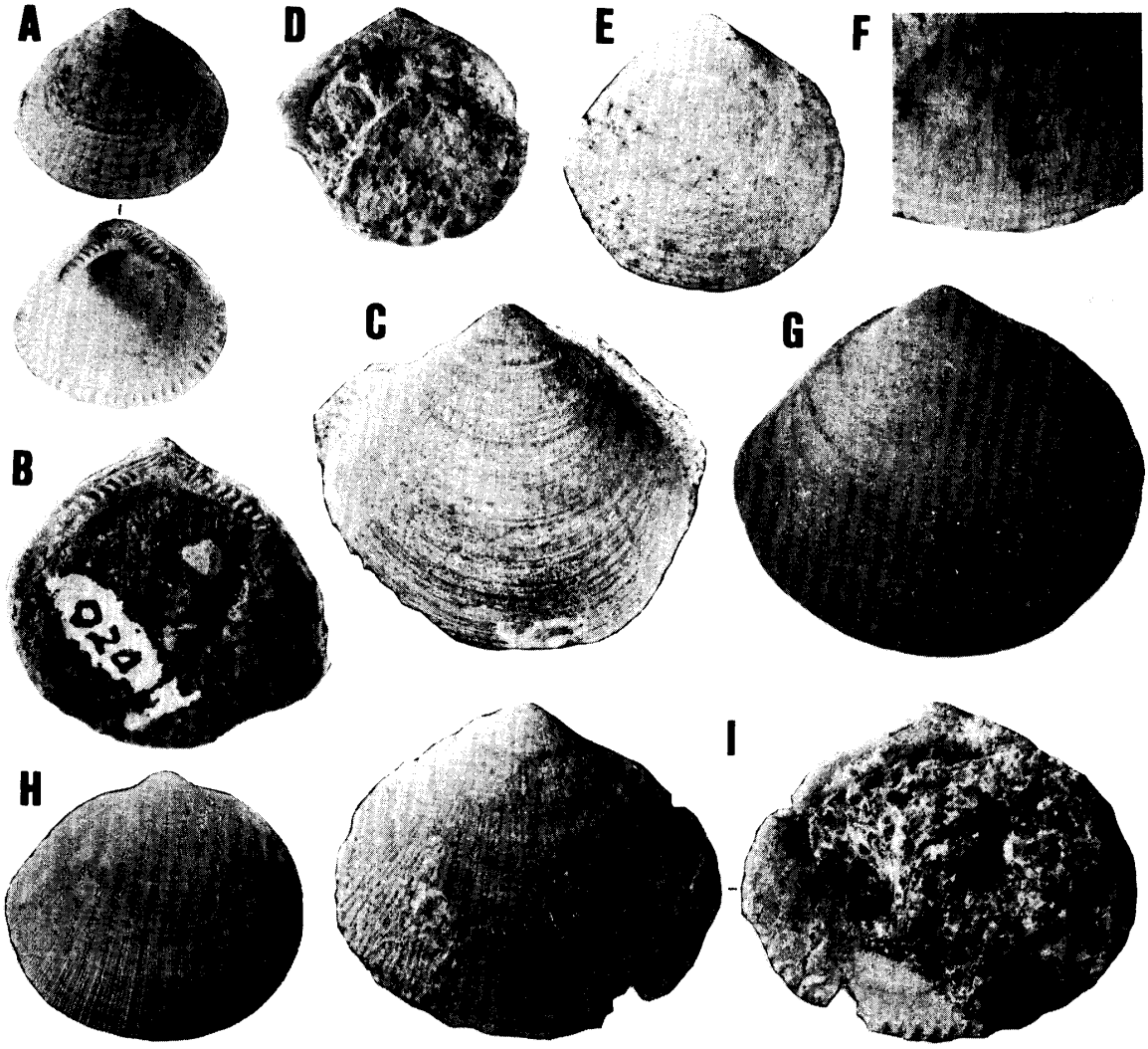

Fig. 2. A–C: *Glycymeris izumoensis* Matsukuma and Okamoto, n. sp. A, NSMT-Mo61509, paratype, L 12.2 mm. B, GSEH-OK020, paratype, H 17.9 mm. C, NSMT-Mo61507, holotype, L 29.5 mm. D–F: *Glycymeris* (*Tucetilla*) *hirayamai* Matsukuma, n. sp. D, NSMT-Mo61450, paratype, H 13.7 mm. E, NSMT-Mo61450, holotype, H 24.5 mm. F, NSMT-Mo61449, paratype, L 22.1 mm. G: *Glycymeris* sp. from Miocene Yanagawa Formation, Fukushima Pref., IGPS coll. cat. no. 39854, L 42.0 mm. H: *Glycymeris* (*Tucetilla*) *pilsbryi* (Yokoyama, 1920) from the Pleistocene Semata Formation, Chiba Prefecture, GK. L10300, L 22.5 mm. I: *Glycymeris subcostata* Matsukuma and Okamoto, n. sp. NSMT-Mo61512, holotype, L 30.6 mm.

east of loc. F2, the Miocene Fujina Formation.

Diagnosis. Small, subtrigonal *Glycymeris* with smooth outer surface except for regularly spaced periostracal striae. Ligamental area inequilateral and deeply grooved. Anterior adductor scar distinctly larger than the posterior. Inner ventral margin coarsely crenulated. Hinge-teeth weak and arranged on substraight rows of anterion and posterior series.

Description. Shell small in size, moderately inflated to compressed, thick, solid, subtrigonal to oval in shape, slightly longer than high, subequilateral and equivalve; anterior and posterior dorsal margins almost straight, forming an angle about 100–110°; anterior and ventral margins gently rounded; posterior dorsal margin more or less shorter than the anterior; posterior margin weakly angulated; an obtuse ridge running from beak to posterior angulation. Outer surface smooth except for regularly spaced periostracal striae. Narrow dark brown lines corresponding with ventral crenulations running from beak to ventral margin. Beak high, small, pointed, situated nearly midpoint of dorsal margin, and slightly opisthogyrate. Ligament amphidetic; ligamental area trigonal, small, inequilateral, and deeply grooved. Hinge-plate narrow; hinge-teeth weak, and arranged on substraight rows of anterior and posterior series. Anterior adductor scar subtrigonal and larger than the oval posterior scar. Inner ventral margin coarsely crenulated; crenulations 18–20 in number.

Measurements (mm) and counts.

	V	L	H	Cs	Nc	Nt	Nl		V	L	H	Cs	Nc	Nt	Nl
NSMT-Mo61507	R	29.5	27.5	(8.4)	-	-	-	GSEH-OK022	L	19.6	18.1	(4.5)	-	-	-
NSMT-Mo61508-1	R	(25)	23.7	(7.9)	-	-	-	NSMT-Mo61509	R	12.2	11.0	3.6	18	9+10	4+2
2	R	19.1	17.6	(4.8)	-	-	-	NSMT-Mo61510-1	R	8.4	7.8	2.5	19	10+9	3+2
3	R	16.1	15.3	3.5	-	-	-	2	R	6.3	6.0	(2.3)	-	-	-
4	R	12.9	12.1	(3.7)	-	-	-	3	R	-	19.2	(6.5)	20	-	-
GSEH-OK020	R	-	17.9	5.2	-	9+9	5+4	GESH-OK023	R	26.2	24.4	(7.4)	-	-	-
GSEH-OK021	L	(17)	16.2	(5.2)	-	-	-	GESH-OK024	R	13.6	12.3	(3.8)	-	-	-

Associated fauna. Glycymeris cisshuensis MAKIYAMA, *Dosinia* (*Kaneharaia*) *kaneharai* YOKOYAMA, *Fissidentalium yokoyamai* (MAKIYAMA), *Turritella* (*Idaella*) *tanaguraensis* KOTAKA and *Olivella* sp. (OKAMOTO, 1959, 1984; NOGUCHI & YUBA, 1982 MS). *G. izumoensis* is fairly abundant at the type-locality, but it seems to be rare in this formation.

Comparison. Glycymeris rhynchonelloides NOMURA and HATAI, 1939 was originally described based on material from the Fujina Formation outcropped at the lake cliff about 300 m northwest of Jakuzan, Fujina, Tamayu-cho, Yatsuka-gun. Although NOMURA & HATAI (1939) described that *G. rhynchonelloides* is characterized by possession of triangular shell with rather strong radial sculpture and high and pointed beak, the very badly preserved type-material, IGPS coll. cat. no. 60020, does not exhibit any characteristics of surface ornamentations, cardinal area and hinge-plate. Any topotypic material has not been reported so far as we aware. Therefore, we prefer to consider *G. rhynchonelloides* as a dubious species.

Glycymeris izumoensis resembles *Glycymeris* sp. described by OGASAWARA and NOMURA (1980) from the Fujina Formation of Nogifukutomi-cho, Matsue City, which has narrow hinge-plate with numerous weak teeth.

Glycymeris izumoensis also resembles *G. rotunda* forma *nipponica* (YOKOYAMA, 1920) from the Pliocene Nojima and Koshiba Formations of Kanagawa Prefecture, but differs in having more compressed shell with regularly spaced, dense periorstracal striae.

Glycymeris (*Tucetilla*) *hirayamai* MATSUKUMA n. sp.

(Figs. 2 D–F)

1973 *Glycymeris* (*Tucetilla*) *pilsbryi* (YOKOYAMA): HIRAYAMA, 166, table 1.

Type. Holotype, NSMT-Mo61449, a left valve, coll. by A. MATSUKUMA, loc. F4 [=loc. C of HIRAYAMA, 1973], a right river cliff near the junction of the Rivers Arakawa and Urayamakawa, about 300 m north of Urayamaguchi railroad station of Chichibu Line, Kuna, Chichibu-gun, Saitama Prefecture, granule conglomerate of the Middle Miocene Hiranita Formation. Paratypes, NSMT-Mo61450, 25 odd valves collected with the holotype.

Diagnosis. Small *Glycymeris* with a subcircular but posteriorly angulated shell. Outer surface ornamented with regularly spaced, distinct periostracal striae. Ligamental area nearly smooth or very shallowly grooved.

Description. Shell small in size, subcircular in shape, posteriorly angulated, inflated to moderately inflated, rather thin but solid, and inequilateral. Anterior and ventral margins gently rounded, postero-dorsal margin truncated. Outer surface smooth except for fine but distinct, regularly spaced periostracal striae. Beak small, rather high, pointed, slightly opisthogyrate, and placed nearly midpoint of the dorsal margin. Ligament amphidetic; ligamental area small, subequilateral, and nearly smooth or very shallowly grooved. Hinge-plate rather thick, and gently arched; hinge-teeth small, and radially arranged. Anterior adductor scar subtrigonal, and larger than the oval posterior scar.

Measurements (*mm*) *and counts.*

	V	L	H	Cs
NSMT-Mo61449	R	22.1	22.0	(7.0)
NSMT-Mo61450-1	R	(24.5)	-	(8.0)
2	R	16.4	16.2	5.5
3	R	18.2	17.5	(5.5)

	V	L	H	Cs
NSMT-Mo61450-4	L	-	13.7	4.0
5	L	15.6	15.0	(6.6)
6	L	(27)	(26)	-

Associated fauna. *Acila* (*Acila*) *submirabilis* MAKIYAMA, *Tucetona chichibuensis* HIRAYAMA, *Megacardita hataii* (HIRAYAMA), *Callista* sp., *Trochus* (*Infundibulum*) *goisiensis* NOMURA, and *Turbo* (*Marmorostoma*) *tochiyensis* KANNO. According to HIRAYAMA (1973), *Lima* (*Lima*) *zushiensis* YOKOYAMA, *Felaneilla usta* (GOULD), *Pitar* (*Pitarina*) sp., *P.* (*Costallipitar*) *concentrica* KANNO and *Tapes* sp. are also common in granule conglomerate at the type-locality of *G. hirayamai*.

Comparison. HIRAYAMA (1973) recorded this species under the name of *Glycymeris* (*Tucetilla*) *pilsbryi* (YOKOYAMA, 1920). Regularly spaced, distinct periostracal striae are common to *G. hirayamai* and *G. pilsbryi*, but the former lacks striated radial ridges with sharp crest which are one of important characters of the subgenus *Tucetilla*.

Tucetona hanzawai granulicostata MATSUKUMA n. subsp.

(Figs. 3 B–C)

1980 *Glycymeris* (*Tucetona*) *hanzawai* NOMURA and ZINBO: NODA, 80, pl. 2, f. 14–16.

Type. Holotype, NSMT-Mo59967, coll. by A. MATSUKUMA, loc. F5, about 500 m

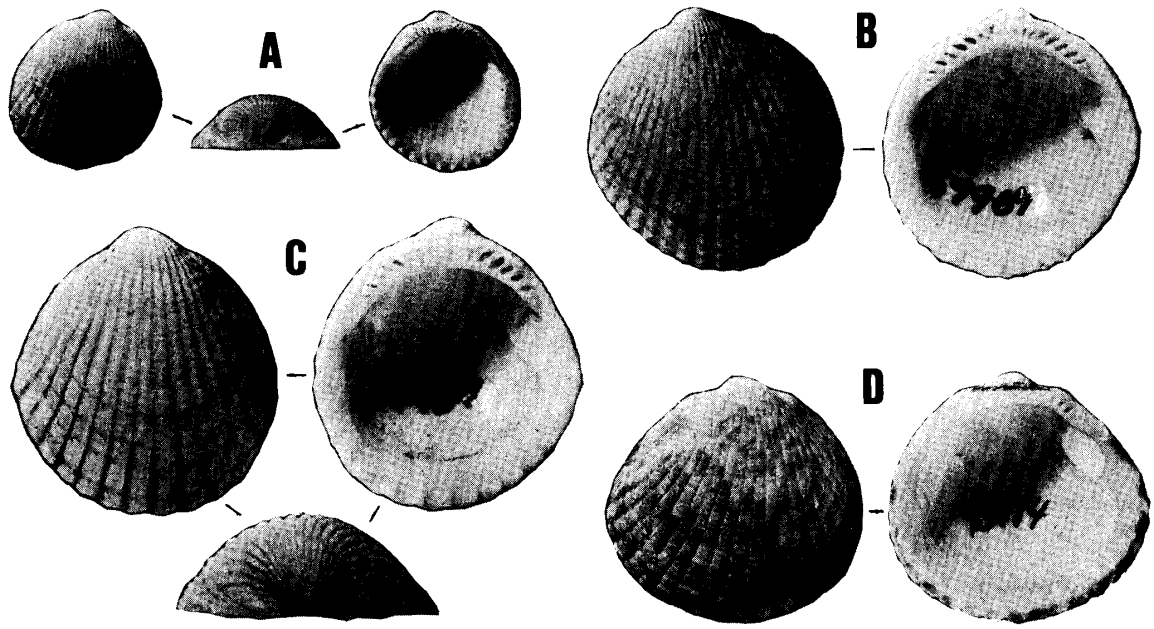

Fig. 3. A: *Tucetona hanzawai hanzawai* (NOMURA and ZINBO, 1934) from the Pleistocene Ryukyu Limestone, Kikaijima, Kagoshima Prefecture, UMUT, unregistered, L 8.7 mm. B–C: *Tucetona hanzawai granulicostata* MATSUKUMA, n. subsp. B, NSMT-Mo59967a, paratype, L 14.6 mm. C, NSMT-Mo59967, holotype, L 15.3 mm. D: *Tucetona shinkurosensis*(HATAI, NIINO and KOTAKA, 1952) from Izu Bank, NSMT-Mo62364, L 14.8 mm.

north of Gushikami Junior Highschool, Gushichan, Shimajiri-gun. Paratypes: NSMT-Mo 59967, collected with the holotype; NSMT-Mo59968, coll. by A. MATSUKUMA, loc. F8, a small cliff at Yakena harbor, Yonagusuku-son, Nakagami-gun; NSMT-Mo59969, coll. by A. MATSUKUMA, loc. F7, a small cliff at Kochinda, north of Kochinda Primary School, Shimajiri-gun; NSMT-Mo59970–59972, coll. by A. MATSUKUMA, loc. F6, a quarry at Gushichan, north of Gushikami Junior Highschool, Shimajiri-gun. All the localities are the Pliocene Shinzato Formation in the main island of Okinawa, Okinawa Prefecture.

Diagnosis. Small *Tucetona* with closely-set concentric growth lamellae. Ribs with sharp crest, trigonal in cross section, and one to three rows of granules concealed under the growth lamellae. Ligamental area deeply grooved. Ventral margin coarsely crenulated.

Description. Shell small in size, oval, slightly higher than long, well inflated, thick, solid, inequilateral and equivalve; anterior and ventral margins gently rounded; posterior margin slightly truncated. Beak somewhat large, strongly opisthogyrated. Shell surface ornamented with trigonal ribs with sharp crest and rounded granules under dense, tile-like growth lamellae; interspaces between ribs about half as broad as ribs themselves. Ligament nearly prosodetic or strongly amphidetic inequilaterally; ligamental area deeply incised by 3–6 chevrons. Hinge-plate moderately thick, strongly arched, and subequilateral; hinge-teeth weak, and set nearly vertical to the dorsal margin. Anterior adductor scar trigonal, larger than the subcircular posterior scar with buttress at the anterior border. Inner ventral margin coarsely crenulated; crenulations 8–14 in number.

Measurements (mm) and counts.

NSMT-Mo59967	R	15.3	16.8	5.9	11	24	12+9	5+3
NSMT-Mo59967-1	R	14.6	15.5	5.0	14	28	10+9	6+3
2	R	17.2	17.3	5.6	12	25	11+9	5+4
3	R	15.8	17.7	6.5	13	28	12+10	6+3
4	R	(16.2)	17.9	5.9	11	24	12+10	6+4
5	R	15.6	16.1	5.4	10	23	12+10	4+3
6	R	15.3	16.3	5.7	11	23	12+10	5+2
7	R	(15)	15.5	5.3	11	25	-	-
8	R	14.4	16.1	6.0	11	23	13+10	5+2
9	R	13.8	14.3	4.9	13	26	12+10	-
10	R	14.9	15.4	5.3	12	24	10+10	4+3
11	R	13.3	13.3	4.6	12	25	9+8	4+2
12	R	12.7	13.0	4.5	12	23	12+10	-
13	R	11.4	12.0	4.3	11	22	11+8	3+3
14	R	10.2	10.3	3.5	10	-	9+8	3+2
15	R	9.1	9.6	3.0	12	24	9+8	-
16	R	7.9	8.4	2.8	11	26	8+7	3+2
17	R	11.0	-	3.7	12	24	8+9	4+3
NSMT-Mo59967-18	L	-	18.4	5.9	12	24	10+9	5+3
19	L	12.9	13.0	4.2	11	25	11+9	4+3
20	L	14.8	15.7	5.7	12	25	10+9	4+3
21	L	(17.3)	(18.3)	6.0	13	28	-	-
22	L	-	13.1	4.4	11	23	-	-
23	L	12.1	12.6	4.1	10	21	-	-
24	L	-	12.6	4.3	12	24	10+9	4+3
25	L	13.6	13.8	5.0	11	23	10+10	4+3
26	L	-	-	-	12	-	-	-
27	L	-	13.9	4.2	11	25	9+9	4+2
28	L	10.5	11.5	3.5	10	20	-	-
29	L	8.8	9.6	3.4	13	26	9+8	-
NSMT-Mo59968-1	R	14.4	15.6	5.7	9	20	10+10	5+4
2	L	15.3	16.3	5.8	10	21	11+9	5+3
3	L	10.9	11.5	4.0	9	21	8+7	3+2
4	L	-	13.1	4.9	8	21	8+7	4+?
5	L	6.0	6.4	2.2	8	18	6+5	2+2
NSMT-Mo59969	L	7.7	7.6	2.6	13	25	-	-

Comparison. *Tucetona hanzawai granulicostata* closely resembles *T. hanzawai hanzawai* (NOMURA and ZINBO, 1934) (Fig. 3A) from the Pleistocene of Kikaijima, Amami Islands, in overall shell shape, but this new subspecies is safely distinguishable from the latter in possession of rows of granules on ribs which are sub-trigonal in cross section and separated by narrower interstices. The shell of *T. hanzawai granulicostata* is usually larger than that of *T. hanzawai hanzawai* and its inner ventral margin is more coarsely crenulated.

Tucetona shinkurosensis Hatai, NIINO and KOTAKA, 1952 (Fig. 3D) is also an allied species, but *T. shinkurosensis* has flat-topped ribs separated by very narrow sulci and ribs lack granules (OKUTANI, 1963). The ventral margin of *T. shinkurosensis* is more finely crenulated.

要　　約

新生代タマキガイ科二枚貝は，形態学的に近縁各科と明瞭に区別ができ，化石として多産し，種ごとの古生物地理学的分布が限られていることから，軟体動物の種分化の過程を検討するためのよい素材だと考えられている．

日本産新生代タマキガイ科中，これまで未記載であった島根県松江市南家の中新世松江層（川津凝灰岩部層）及び同県出雲市上塩屋町菅沢の中新世布志名層産 *Glycymeris* (s.s.) の2新種，埼玉県秩父郡荒川村久那（秩父鉄道浦山口駅北）の中新世平仁田層産 *Glycymeris* (*Tucetilla*) の1新種，並びに沖縄県島尻郡具志頭村，東風平村及び中頭郡与那城村の鮮新世新里層産 *Tucetona* の1新亜種を記載した．

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